



HONOLULU
LA JOLLA
MONTEREY
TIBURON



SOUTHWEST FISHERIES CENTER

MONTHLY REPORT - FEBRUARY 1983 TABLE OF CONTENTS AND RESEARCH HIGHLIGHTS

	<u>PAGE</u>
PUBLICATIONS	1
HONOLULU LABORATORY	6
Cooperative Squid Research Cruise Completed	9
Work Continues on Studies of the Magnetic Compass Sense of Pelagic Fishes	10
LA JOLLA LABORATORY	13
Anomalous Ocean Conditions off Southern California Monitored.	13
U.S. Mexican Research Ties Discussed.	19
New Marine Mammal Assessment Procedure Evaluated	22
TIBURON LABORATORY	25
Northern California Rock Crab Fishing Develops.	25
Identification of Serum Proteins in Striped Bass Initiated.	27
FISHERIES INFORMATION SYSTEMS AND AUTOMATIC DATA PROCESSING	29
Implementation of Standard Word Processing System Discussed.	30
MISCELLANEOUS.	32
Honors, Awards, Seminars, Public Affairs, Visitors Meetings and Travel, and Personnel	32



SOUTHWEST FISHERIES CENTER

CENTER ADMINISTRATION — La Jolla, California

Center Director.....	<i>Izadore Barrett</i>
Deputy Director	<i>John F. Carr</i>
Planning Officer.....	<i>David J. Mackett</i>
Data Systems Manager	<i>Fred J. Kellenberger</i>
Executive Officer.....	<i>Benjamin F. Remington</i>

LABORATORIES & DIVISIONS

Coastal Fisheries Research Division, Chief	<i>Reuben Lasker</i>
La Jolla, California	
Honolulu Laboratory, Director.....	<i>Richard S. Shomura</i>
Honolulu, Hawaii	
Oceanic Fisheries Research Division, Chief.....	<i>Gary T. Sakagawa</i>
La Jolla, California	
Pacific Environmental Group, Chief	<i>Gunter R. Seckel</i>
Monterey, California	
Tiburon Laboratory, Director	<i>Norman J. Abramson</i>
Tiburon, California	

The Monthly Report of the Southwest Fisheries Center is compiled by the Technical Writing/Editing Group at La Jolla from material submitted by the Center's staff. To change the delivery address of the Monthly Report, or to cancel your subscription, please notify Lillian Vlymen, Editor, at P.O. Box 271, La Jolla, CA 92038.

SOUTHWEST FISHERIES CENTER
LA JOLLA, CALIFORNIA

HONOLULU LABORATORY
LA JOLLA LABORATORY
TIBURON LABORATORY
PACIFIC ENVIRONMENTAL GROUP

MONTHLY REPORT - FEBRUARY 1983

STATUS OF PUBLICATIONS

Published

Bretschneider, Dale Emile and Douglas R. McLain. 1983. Sea level variations at Monterey, California. NOAA Tech. Rep. NMFS-SSRF-761, 50 p.

Sea level data from Monterey California during the period 1963 through 1976 were compared with data from coastal stations from Peru to Alaska. Sea level fluctuations at Monterey were correlated with data from these stations, particularly those to the south. The causes of sea level fluctuations at Monterey were investigated by correlation, regression, and spectral analysis of sea level with atmospheric pressure, zonal and meridional wind stress, Ekman and Sverdrup transport, surface temperature and salinity, and dynamic height data from nearby locations. Of these variables, dynamic height was the best predictor of sea level fluctuations. Atmospheric pressure, surface temperature, and meridional wind stress were of secondary importance. The prediction was better during the Davidson Current period than during the upwelling period.

Eldridge, Maxwell B., Jeannette A. Whipple, and Michael J. Bowers. 1982. Biogenetics and growth of striped bass, Morone saxatilis, embryos and larvae. Fish. Bull. (U.S.), 80(3):461-474.

Fluctuations in year class size of striped bass are known to be related to development and survival in the early life stages. Bioenergetic aspects of growth and development of striped bass

embryos and larvae were determined in the laboratory to discover some of the physiological needs and processes of these stages from fertilization to metamorphosis.

Energy was provided by endogenous (yolk and oil globule) and exogenous (*Artemia* sp.) sources. Initial amounts of yolk and oil varied significantly among eggs from seven different females, and these differences were reflected in different patterns of consumption and growth. Feeding larvae consumed their endogenous oil at rates related to exogenous food intake. Daily food rations of larvae from the onset of feeding to metamorphosis were estimated for field and laboratory conditions. Rations increased with size and age of the larvae. Wild larvae were estimated to have daily rations substantially greater than those of cultured larvae.

Energy outputs were measured in growth and oxygen consumption. Egg size (total dry weight) directly influenced early periods of growth, but later compensatory growth, seen in more rapid growth in larvae from smaller eggs, made up for initial differences. Growth and food consumption were linearly related and, again, different growth characteristics were seen in each batch of fish. Embryos and prefeeding larvae had the highest Q_{O_2} , while metabolism on a weight-specific basis increased with tissue dry weight and was best described by a power function.

Gross caloric conversion efficiencies were highest from fertilization to initial feeding. Feeding larvae used their resources at levels under 20% and their conversion efficiencies did not appear to correlate with food concentration.

In an energy budget model, striped bass embryos and larvae given the highest food density consumed yolk energy at constant rates until totally absorbed. Oil globule consumption fluctuated in relation to growth and nonassimilation, rising sharply after first feeding then declining as food intake increased. Metabolism fluctuated according to developmental stage, rising with the onset of active feeding. Nonassimilation steadily increased as larvae relied more on exogenous food.

Ralston, Stephen and Jeffrey J. Polovina. 1982. A multispecies analysis of the commercial deep-sea handline fishery in Hawaii. Fish. Bull. (U.S.), 80(3):435-448.

In the Hawaiian Islands 13 species of bottom fish are commonly harvested in the commercial deep-sea handline fishery. These are all high-level carnivores, including snappers, jacks, and a species of grouper, which are sought in water depths ranging from 60 to 350 m. Cluster analyses performed on the Hawaii Division of Fish and Game commercial catch report data suggest the existence of three bottom fish species groups which apparently segregate on the basis of depth distribution. These groups seem to be stable through time and similar among differing geographic localities.

Two measures of fishing effort, catch-records and fisherman-days, were compared to determine which is more suitable for use in stock-production analyses. Fisherman-days was selected because, among other reasons, it repeatedly demonstrates a stronger negative correlation with catch per unit effort.

Application of the Schaefer stock-production model to this multi-species fishery on a species-by-species basis provides an inadequate description of productivity. When catch statistics are aggregated according to the three cluster analysis species groups the results are much improved. In this regard consistently significant results and production estimates were obtained from the Maui-Lanai-Kahoolawe-Molokai bank, a region which presently accounts for about half of the total Hawaii catch. No significant interaction among the cluster groups was detected. When all 13 bottom fish species are analyzed together, the results are in agreement with the preceding analysis. Examining the aggregation process suggests that the model based on the intermediate level of aggregation (cluster groups) explains slightly more of the variation in total catch than does the model which treats all 13 species together.

We estimate the annual maximum sustainable yield of the commercial deep-sea handline fishery around the Maui-Lanai-Kahoolawe-Molokai bank to be 106 metric tons or about 272 kg/nmi of 100-fathom isobath. Because recreational catch is unaccounted for these figures are considered lower bounds for the gross production obtainable from this type of fishery although currently the commercial fishery is operating close to this maximum-sustainable-yield level.

Squire, James L., Jr. 1983. Abundance of pelagic resources off California 1963-1978, as measured by an airborne fish monitoring program. NOAA Tech. Rep. NMFS-SSRF-762, 75 p.

From September 1962 through December 1978 commercial aerial fish-spotter pilots operating off southern and central California and northern Mexico, maintained a flight log indicating the geographical areas searched and an estimate of the quantity of pelagic species observed. These flight logs were analyzed for quantities of the various species observed per block area (10° longitude by 10° latitude area). Flights were recorded as surveying all or a portion of 164,753 block areas. A total of 110,375 block areas were surveyed during the day and 54,378 during the night operations. An annual index of apparent abundance (arbitrary values) was computed for each of the major species observed, both for day and night aerial observations from selected geographical areas, and for total observations. The index value computed is not directly comparable between species.

During the period of the survey, the apparent abundance index for Pacific sardine, Sardinops sagax caerulea, declined from 1.03 in 1964 to 0.00 in 1974, and no significant schools have been observed by aerial surveys since. The northern anchovy, Engraulis

mordax, night apparent abundance index remained relatively constant from 1963 to 1969 (2.99-4.35), increased substantially in 1973 to 14.99, then declined by 1978 to a level (1.91) near that observed in 1963-69. The day index for Pacific bonito, Sarda chiliensis, declined to a low level in 1968-69 (0.43-0.26), increased in 1972 to 1.11 (a year of above average sea surface temperature), and in subsequent years declined again to a low level (+ 0.1). Pacific mackerel, Scomber japonicus, population biomass was apparently low in 1962 at the start of the surveys, and continued to decline to very low night abundance levels during 1967-75 (undefined range of 0.00 to 0.03). In 1976 a small increase in the overall apparent index was recorded. By 1977 the night index had increased to 2.62, and in 1978 it again increased to a high level of 7.46. Jack mackerel, Trachurus symmetricus, showed a declining abundance index value during 1969-75 (0.66-0.40). A small increase in the night index apparent abundance was noted in 1976, and in 1977 the night index increased to 2.77. In 1978 it then increased about 1.5 times to a record high of 4.20.

Downward trends in apparent abundance indexes were noted 1 to 2 years in advance of declines in the commercial catches for northern anchovy and Pacific bonito. Limitations of collected nonrandom data and variations in sightings and school size estimation between pilots are discussed. The apparent abundance indexes obtained from aerial surveys are compared with measures from larval and acoustical surveys.

A rank correlation analysis was made to measure the agreement between independent estimates of northern anchovy spawning biomass, larval index, and aerial index. Significant correlations were found for the aerial and acoustical survey indices of 1972-78 for the northern anchovy ($r_s = 0.810$, significant at the 0.05 level). During this period only three larval surveys were conducted, insufficient to calculate correlation. For earlier data, 1962-66 and 1968-69, larval vs. aerial index gave a poor correlation (+ 0.30). A significant correlation was evident for Pacific mackerel aerial index vs. spawning biomass index ($r_s = 1.00$).

Translation

Katakura, Genji. 1982. The efficiency of calcium chloride brine freezing (Enkalu burain tōketsu no kōa). Suisan Shuho (The Fishing and Food Industry Weekly) 946:50-56. (Engl. transl. by Tamio Otsu, 1982, 11 p., Transl. No. 77; available Southwest Fish. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96812).

Approved by Center Director

- Alcorn, Doris J. and John R. Henderson. Double nursing and weaning of Hawaiian monk seal pups. 'Elepaio.
- Huppert, Daniel D. Forage fish management: Experience with California's anchovy fishery. For consideration for publication in MRF Symposium papers.
- Hunter, J.R. Synopsis of culture methods for marine fish larvae. For consideration for publication in the Ahlstrom Series.
- MacCall, Alec D. and Gary D. Staffer. Biology and fishery potential of jack mackerel (Trachurus symmetricus). For consideration for publication in CalCOFI Reports.
- MacCall, Alec D. Variability of pelagic fish stocks off California. For publication in Expert Consultation on Fisheries Symposium, convened by G. Sharp and J. Csirke, San Jose, Costa Rica, April 1983.
- Methot, Richard. Management of California's nearshore fishes. For consideration for publication in MRF Symposium papers.

HONOLULU LABORATORY

INSULAR RESOURCES INVESTIGATION

Seamount Cruise Planned

Richard N. Uchida, Leader of the Insular Ecosystem Program and designated Chief Scientist Robert L. Humphreys, Jr., prepared preliminary cruise instructions for Townsend Cromwell cruise TC-83-02, which is scheduled to be conducted June 2-July 27 to the central North Pacific seamounts. The objectives of the cruise are to conduct (1) a bottom trawl survey for pelagic armorhead, Pentaceros richardsoni, and alfonsoin, Beryx splendens, at Hancock, C-H, Colahan, and Yuryaku Seamounts, (2) environmental sampling over the seamounts, and (3) coral drags on seamounts. Among the secondary missions are to test the Korean fish traps, bottom gill net, and modified vertical longline to determine their effectiveness as sampling tools for the seamount fauna.

Work Continues on Validation of Growth Increments on Otoliths

James J. Uchiyama, Fishery Biologist, continued his work on validating the daily increments on the sagitta of pig ulua, Pseudocaranx dentex. Two pig ulua, which were injected with oxytetracycline on Townsend Cromwell cruise 82-05 and brought back for observations at the Waikiki Aquarium, died after 62 days in captivity. The sagitta of the smaller (17.8 cm FL) specimen showed a fluorescent band under ultraviolet excitation. A total of 60-62 growth increments were counted between the fluorescent band and the edge of the rostrum. These results provide some evidence that the growth increments are formed daily. The sagitta of the larger (38.2 cm FL) specimen is being sectioned for observation.

Uchiyama also conferred with Anthony I. Sudekum, a graduate student at the University of Hawaii (UH), who is working on the age and growth of Caranx ignobilis and C. melampygus. Sudekum has been rearing these species at the Kewalo Research Facility after injecting them with oxytetracycline. He will be using the Honolulu Laboratory's ultraviolet microscope to validate the daily growth increments on otoliths.

Work on Manuscripts Continues

Fishery biologist Richard Uchida resumed analysis of data collected during spiny lobster (Panulirus marginatus) trapping operations in the Northwestern Hawaiian Islands (NWHI). The analysis will be included in an overview report of the Honolulu Laboratory's work for the NWHI symposium which is scheduled in late May. Reports are also being prepared on shrimp, bottom fish, pelagic fish, monk seal, green turtle, reef fish, and seamount resources by other Honolulu Laboratory researchers.

Fishery biologist James Uchiyama, aided by research assistant Jeffrey Sampaga, completed tables for the NWHI atlas consisting of (1) a species list of all crustaceans, molluscs, and fishes caught in NWHI surveys, (2) the depth distribution by banks of all the species, and (3) the size range of all the species and a list of the gear used to capture all the species.

Uchiyama and research assistant Darryl Tagami revised a manuscript on the length-weight relationships of snappers, carangids, and a grouper caught in the NWHI handline fishery. Tagami has been recomputing the length-weight relationships based on an expanded data set, which should greatly improve the relationships for the minor species.

Analysis of Wahoo Food Habits Completed

Research assistant Steven Kramer reports the completion of a food study of wahoo, *Acanthocybium solandri*, from the Northwest Hawaiian Islands (NWHI). A comparison of his data with those of a recently completed study of the food habits of wahoo caught off the east coast of the United States and the Gulf of Mexico showed that wahoo in the NWHI appeared to have a larger vertical feeding range. Kramer noted a much higher frequency of Monacanthidae such as *Pervagor spilosoma* in the gut contents of wahoo from the NWHI. Other than this difference, feeding habits of wahoo from both areas seemed similar in that they were highly piscivorous (fish-eating) and seemed to prefer the larger pelagic and outer bank-associated prey.

Movie Producer Selected for Documentary Film

Reginald M. Gooding, Fishery Biologist, reports that a cinematography studio, Cine-Pic Hawaii Corp., was selected by the Northwest Hawaiian Islands (NWHI) film committee to produce a 28-minute documentary film on the recently completed cooperative study of the NWHI. Gooding worked with Cine-Pic personnel to organize material, plan script, etc., to enable the film producer to start editing and cutting film by March 1.

* * * * *

Reginald Gooding reviewed the video tape records made on the Makalii dives on Penguin Bank to identify (as accurately as possible) fishes and invertebrates and determine their relationships to environmental parameters such as substrate type, depth, and temperature.

FISHERY MANAGEMENT RESEARCH PROGRAM

Fishery Monitoring Activities: A Progress Report

Dr. Robert A. Skillman, Leader of the Fishery Management Research Program, reports that a paper, "A note on the commercial fisheries in Hawaii" by Thomas S. Hida, Fishery Biologist, and Dr. Skillman has been revised in response to a review by the staff of the Hawaii Division of Aquatic Resources and is now ready for release as an administrative report. This paper describes some of the key fisheries, for example skipjack tuna bait boat, bottom fish, and troll fisheries, and presents data for 3- to 10-year periods for comparative purposes.

An administrative report by Gary L. Kamer, Statistician, describing the procedures employed in making the Laboratory's weekly statewide estimates of skipjack tuna landings was approved for release.

In response to interest shown by the Western Pacific Regional Fishery Management Council (Council) and other parties on the degree of local participation in fishing activities, a summary was prepared some months ago of the number of fishing boats by rather broad categories appearing in the public record. In continuation of that effort, data have been transcribed from the State of Hawaii's commercial fishing license records for 1981 and 1982. Access has also been gained to the 1979 and 1980 records which were archived. Hence, a report can now be prepared for the period of interest to the Council.

With respect to recreational fishing activities in Hawaii, tournament weigh slips for 1982 have been received from the Pokai Bay Boat Club, and logbooks for the period March 29, 1982 through January 6, 1983, from the Hickam Air Force Base charter boat. All the records obtained from the Air Force charter boat and from the Hawaii Fishing News are now being analyzed by Hida, Dr. Skillman, and research assistant Nathaniel T. Shippen.

On March 9, 1983, the regulations for the spiny lobster fishery management plan for the western Pacific region will go into effect. Ray F. Sumida, Fishery Biologist, has been working closely with the staff of the Western Pacific Program Office (WPP0) in preparation of logbook, trip report, and processor report forms which must be completed by the vessels participating in the fishery for submission to WPP0.

Socio-Economic Research Updated

Significant progress has been made on several projects contracted to private vendors. Hawaii Opinion, Inc. has completed the fielding of the tuna longline and deep-sea handline survey and has prepared summaries of preliminary results. The data contained in their report are now being used in various vessel simulators being developed by Samuel G. Pooley, Industry Economist, using spread sheet software on a microcomputer. SMS Research is proceeding with the survey of the retail fish sector and is now surveying

military establishments on seafood purchases. The draft report on the mahi mahi (dolphin) and wahoo markets in Hawaii by B.T. and Associates has been returned to them for minor modification.

Honolulu Laboratory Researchers Participate in Council Activities

Industry economist Samuel Pooley participated in the first meeting of the reconstituted bottom fish plan development team. The team developed the groundwork for a framework fishery management plan as approved by the Western Pacific Regional Fishery Management Council (Council) and the Southwest Region.

The Council's Scientific and Statistical Committee (SSC) during its 28th meeting in Honolulu from January 17 to 19, 1983, investigated the issues, problems, and proposed activities on the production of a framework fishery management plan for bottom fish in the western Pacific region. This activity was undertaken to assist the Council and associated bodies, particularly the plan development team. David J. Mackett, Planning Officer for the Southwest Fisheries Center, served as the facilitator for this planning session, assisted by Dr. Skillman. A final report entitled "Report on the planning meetings for the preparation of the bottom fish framework fishery management plan" was completed and submitted to the SSC in time for the February meeting of the Council in Saipan and Guam.

Hawaii Skipjack Tuna Landings Below Average

The February 1983 Hawaii landings of skipjack tuna were estimated at 17.9 metric tons (MT), which is 12.7 MT below the February 1982 landings and 88.6 MT below the 1964-80 long-term average for February. The cumulative landings from January through February were estimated at 70.8 MT which is 19.6 MT below the 1982 landings for the same period and 186.9 MT below the 1964-80 long-term average for the same period.

PELAGIC RESOURCES INVESTIGATION

Cooperative Squid Research Cruise Completed

Walter M. Matsumoto, Fishery Biologist, and research assistant Michael P. Seki returned from a 2-week cooperative squid research cruise on board the Hokkaido University's Hokusei Maru. This was the third and final cruise of a cooperative research effort between the Southwest Fisheries Center (SWFC) and Hokkaido University.

The first leg of the cruise occurred off the coast of Hilo, Hawaii, and consisted mainly of hydrographic work involving oceanographers from the University of Hawaii (UH). Squid fishing with automatic jigging machines was done at three 2-3 hour stations on each of three nights. Catches were

especially good off Pepeekeo Point, where they totaled 245 squids, Symplectoteuthis oualaniensis, at three stations (catch rate of about 12 squids per machine per hour). Catches were much lower at the stations off Hilo (123 squids) and off Kumakahi Point (124 squids) where the catch rate was 4.7 squids per machine per hour. Most of the squids taken off Pepeekeo Point were large, 20-28.7 cm, whereas only eight off Hilo and four off Kumakahi Point were in this size category. In addition, several Nototodarua hawaiiensis, a squid species generally considered to be abundant during summer, were taken in three bottom trawl hauls.

In the second part of the cruise, 8 all-night jigging stations over seamounts south of Oahu and west of Hawaii yielded a total of 144 squids (143 S. oualaniensis and 1 Onychoteuthis compacta), for a catch rate of 0.4-0.5 squid per machine per hour. These were small squids, mostly below 20 cm. Four gill net stations yielded four small (8-17 cm) O. compacta, and eight midwater trawl hauls resulted in a few juveniles of other species of squid.

Modifications Being Made to the RV Kaahale'ale

Dr. Richard Brill, Leader of the Experimental Ecology of Tunas Program, reports that based on the experience gained during last summer's work using the Kaahale'ale to track tuna, Thomas K. Kazama, Fishery Biologist, and Lt.(jg) J. Scott Ferguson have been remodeling the upper and lower cabins of the vessel. The work is centered around building cabinets and shelves to accommodate the microcomputer and associated instrumentation to be used during this summer's attempts to track tuna around fish aggregating buoys. Rewiring and upgrading of the 120 and 12 V electrical systems will begin later in the month.

Work Continues on Studies of the Magnetic Compass Sense of Pelagic Fishes

Michael M. Walker, University of Hawaii (UH) graduate student, reports that he has successfully extracted, isolated, and photographed magnetite crystals from yellowfin tuna, Thunnus albacares. The crystals were positively identified as magnetite through the use of a transmission electron microscope at the California Institute of Technology. Researchers believe that magnetite is part of the "navigational system" of a number of animals, a system which enables tuna to migrate long distances, using the earth's magnetic field as their guide.

Walker, in association with Dr. Jeffrey Corwin, UH Department of Zoology, has been able to tentatively identify structures that appear to be nerves innervating the suspected magnetic receptor organ in yellowfin tuna. Work to stain and identify iron and magnetite crystals in these tissue sections is in progress.

Research assistant Martina K.K. Queenth has been using behavioral tests to see if adult mahi mahi, Coryphaena hippurus, can detect changes in the earth's magnetic field, as yellowfin tuna have been able to do. Although the

mahi mahi initially seemed amenable to training, the behavior of the two animals tested so far has rapidly degenerated (i.e., they would no longer swim through a hoop for a food reward) to the point that neither fish could be used under the current testing regime.

Studies on Tuna Reactions to Odors Continue

Dr. Kim Holland, Hawaii Institute of Marine Biology, is continuing behavioral tests on the reactions of tunas to natural prey odors, various molecular weight fractions of natural prey odors, and artificial odors. Current work is centered on kawakawa, Euthynnus affinis, to provide odor preference hierarchy data to compare with those already obtained from yellowfin tuna.

Although the initial attempts to record "electro-olfactograms" (a quantitative measure of the stimulatory effectiveness of an odor) in mullet were successful, Dr. Brill's attempts to do the same in tuna have been unsuccessful. Work on this project is currently suspended pending a review of methodologies.

DATA MANAGEMENT AND TECHNICAL SERVICES

Computer Programmers Hired to Develop Programs and Management Procedures

Fletcher V. Riggs, Leader, Data Management and Technical Services (DMTS), reports that two new employees, Kathleen M. Lau and Amy F. Nishimura, Computer Programmers, have joined the staff. These two part-time positions are funded by the Center's Data Systems Program, to aid in the development of management procedures and programs for Honolulu Laboratory data resources. Some specific areas to receive the attention of Lau and Nishimura are data capture and management systems for tuna, fisheries monitoring, and marine mammal data resources. In addition they will work closely with Lucille T. Tsukano, Computer Aid, toward increased utilization of the Laboratory's new key-to-disk data entry hardware and eventual elimination of data capture on cards.

Computer Services Contract Extended

The East-West Center (EWC) has agreed to extend the computer services contract with the Honolulu Laboratory until the end of March, 1983, to allow an additional month of processing while the Laboratory will reduce the number of ports and accounts on the EWC system to a level adequate for word processing only. All non-word processing files that users have identified to be saved have been copied on 9-track magnetic tape by Ronald C. Antinoja, Computer Programmer, for immediate use on the University of Hawaii IBM system or for future use on the Laboratory's in-house system. In addition, a small number of files will be copied on 8-inch diskettes for those persons requiring immediate access to the data on microcomputer systems capable of reading IBM 3740 formatted diskettes.

Microcomputer System Approved for Honolulu Laboratory

The acquisition of a multiuser microcomputer system for the Honolulu Laboratory has been approved and final terms of the contract are being worked out by the Western Area Service Center with QSA, Inc., the vendor. The system is a molecular supermicro with a maximum capability of handling 32 users. Each user will have a Z80 processor with 64 K of RAM and will share a 136 Mbyte 14-inch Winchester disk drive. The individual user processors will run under the CP/M operating system. Also available will be a 9-track, 1600 bpi tape drive and an 8-inch, double density, single-sided diskette drive. Initially this system will have eight user processors. Additional users will have access to the system as more processors and terminals are acquired by the Laboratory. The Center has made available funds for a general purpose (shared) printer and for intersystems communications between the molecular microcomputer, the Laboratory's key-to-disk data entry system, and the UH IBM 370.

* * * * *

Efforts have begun by Sally H. Kuba, Computer Programmer, and Ronald Antinoja to prepare a single, complete list of all data files maintained by Data Management and Technical Services (DMTS). This is an important initial step toward the ultimate goal of a comprehensive, well-documented account of all data resources and associated processing procedures handled by DMTS.

LA JOLLA LABORATORY

Coastal Fisheries Resources Division

COASTAL EASTERN PACIFIC FISHERIES ENVIRONMENT INVESTIGATIONS

Anomalous Ocean Conditions off Southern California Monitored

Oceanographers Ron Lynn and Ken Bliss report that during January and February, oceanographic conditions were largely anomalous within 100 nautical miles of the southern California coast. Ocean scientists working in the tropical and eastern North and South Pacific have noted that very strong "El Niño" conditions have been building since last fall. Widespread ocean warming has been found in the tropics and along the west coasts of the North and South American continents.

Bliss has processed the oceanographic data collected on the NOAA research vessel Townsend Cromwell transect from Honolulu to San Diego during January with Dr. Paul Smith, Fishery Biologist, as the Chief Scientist. Temperatures near the California coast are 2° to 3°C above the long-term average and the thermocline is depressed to approximately 60 meters from an average 20 to 30 meters. The geopotential of the sea surface relative to 500 decibars is 10 dynamic centimeters above average and is the highest value on record. (This quantity is the integrated water column density and is used in computing geostrophic velocity.) The consequence of this finding is that the California countercurrent is much stronger and broader than normal. As a result of these ocean changes, large changes in the local fisheries and other biota are expected.

COMMERCIAL AND RECREATIONAL FISHERIES RESEARCH FOR MANAGEMENT

PacFIN Data Base Design Modified

Dr. Daniel Huppert, Industry Economist at La Jolla, reports that the Pacific Fishery Information Network (PacFIN) Research Data Base Design has been slightly modified following a January 28 meeting of the Pacific Fisheries Data Committee. These changes were initiated in response to State agency requests and comments. Additional "Vessel ID" types have been added to allow States to report in a variety of ways regarding records not having standard ID's (i.e., Coast Guard, State Marine Board or State Agency Plate Numbers). Condition codes and disposition codes have been augmented to facilitate reporting of all landings, and size/grade codes have been added. The size codes will primarily pertain to salmon and sablefish landings. Also, the system will now require that landings be reported in actual landed weight, rather than round weight equivalent.

Current plans call for the State data tapes to be produced in the PacFIN Research Data Base format and for these to be combined into a data base at the SWFC by the end of August.

The planned Bay Area Sportfish Economic Study (BASES) is being initiated with a user-group meeting at Tiburon on March 23. The purpose of the meeting is to compile a set of recreational fishing issues important to the Bay area and to set up a priority list of subjects for recreational studies. These will focus on economic evaluations and impact statements relevant to a wide variety of public decisions likely to affect the fisheries during the next 5 years or so. Dr. Huppert will use the meeting results in designing contract studies for the SWFC and will distribute a description of the results to other responsible agencies (Fish and Wildlife Service, Sea Grant, California Department of Fish and Game) so that they may utilize this input in their planning as they see fit.

Anchovy FMP Options Analyzed

Cindy Thomson, Industry Economist, has devoted most of the last 2 months to writing a Regulatory Impact Analysis (RIA) for the Anchovy Fishery Management Plan. This is a comparative analysis of all the reduction and non-reduction optimum yield formulas, season closures, geographic allocations and fish/meal size limits being considered under the plan. Each option is analyzed in terms of its biological impact on the resource, monitoring and enforcement costs, and costs of compliance and paperwork burden imposed on vessel operators. The RIA also examines social implications of each option (where appropriate) and the economic impact at the harvesting and processing levels--including the impact on costs of goods and services, competition, employment, investment and productivity.

Papers Presented for Marine Recreational Fisheries Symposium

Dr. Richard Methot, Fishery Biologist, has prepared a paper entitled "Management of California's Nearshore Fishes" for presentation at the Marine Recreational Fisheries Symposium in April 1983, San Diego, and subsequent publication in the symposium proceedings. The histories of Pacific mackerel, Pacific bonito, California halibut, and white seabass are discussed with emphasis on the problems that have resulted in changes in management practices. Pacific mackerel now is the healthiest of these stocks and is managed with the strictest regulation, an annual catch quota. Current challenges being faced by the management agencies are: development of cooperative research and, perhaps, management programs with Mexico; excess effort in the commercial fishery and shifts in this effort to relatively unregulated gear such as gill nets; and poor knowledge of species identification and fishing regulations among sport fishermen.

Dr. Daniel Huppert, Industry Economist, completed another paper for the Marine Recreational Fishing Symposium entitled "Forage Fish Management: Experience with California's Anchovy Fishery". Both the California State and Federal management programs are reviewed from a historical perspective.

Important and controversial issues associated with the anchovy fishery are discussed, including (1) the role of the anchovy in supporting the abundance and nearshore concentration of predator fish, (2) the biological uncertainty present in population assessment, (3) the need for a minimum size limit in the commercial purse seine fishery, and (3) problems raised by the lack of international cooperation in management. Needless to say, the paper does not resolve these issues, but it does provide an overview of evidence, conflicts and current management measures designed to address the public controversies and conservation needs.

Anchovy Age Composition Reanalyzed

Dr. Richard Methot, fishery biologist, has prepared a draft administrative report entitled, "Recommendation of anchovy age composition in trawl surveys". Past computations of anchovy age composition in trawl surveys conducted by California Department of Fish and Game have treated each trawl equally. The 10 aged fish from a large catch made the same contribution to the survey's age composition as the 10 fish from a small catch. Some regions, however, implicitly made a greater contribution because more trawls were taken where sonar observations indicated greater abundance of schooled fish. The computed age compositions consistently have indicated undersampling of young fish.

Methot's recomputation divides the survey into a grid of 20 minute latitude-longitude blocks, computes conventionally the age composition within each block, then calculates the overall age composition by weighting each block's contribution with the mean catch in that block. The recomputed age composition typically has about 40% more 1 year old fish than the conventionally computed overall age composition. This indicates that large trawl catches typically are composed of young fish. Weighting each block's age composition by the sonar observations in that block actually decreases the calculated relative abundance of young fish. Apparently the schooled fish most visible to the sonar are typically older fish.

Paper Completed for FAO Conference

Fishery biologist Alec MacCall completed a paper entitled "Variability of pelagic fish stocks off California" which will be presented in April at the FAO Fishery Consultation in San Jose, Costa Rica. The paper reviews the history and status of the pelagic wetfishes (sardine, anchovy, jack and Pacific mackerels) and some of the larger predatory fishes (bonito, barracuda and white seabass). It also discusses some causes of fishery variability, including fluctuations in recruitment and mortality rates, and climatic changes. Also, another paper on jack mackerel is nearing final draft form; sections written by co-author Dr. Gary Stauffer, NMFS-Northwest and Alaska Fisheries Center, were received and incorporated in the manuscript.

Progress on 1983 Anchovy Biomass Survey

The 1983 anchovy egg production survey by the NOAA research vessel, Townsend Cromwell, has been progressing fitfully. The Cromwell has a very fast roll, causing occasional reversal of plankton net trajectory, with probable loss of some contents. This problem has been lessened by speeding up the retrieval rate to the maximum speed allowed by the winch. The unusual El Niño-like water conditions (higher than normal sea temperatures) that have developed recently seem to have caused a northward and offshore shift in spawning area compared to previous years. Accordingly, the station plan has been modified to encompass offshore coverage. Further modifications are being made to deal with contingencies such as lost time due to heavy weather and last-minute receipt of permission to survey Mexican waters. The experience and expertise of Southwest Fisheries Center scientists has proved invaluable in conducting this survey, given the variety of unexpected difficulties that have been posed.

Analysis Begins for Anchovy Biomass Estimate

As the first step in producing the 1983-84 egg production biomass estimate for the northern anchovy Susan Picquelle, Statistician at La Jolla, examined the question of how large a sample size of mature females is required to ensure a desired degree of accuracy. She produced a relationship between subsample size (number of females per trawl) and the number of trawls, where the mean and coefficient of variation of the parameter are specified. This relationship requires an estimate of the intra-trawl correlation coefficient which was estimated using the trawl data from the 1982 biomass survey. Graphs were produced showing this relationship for the parameter spawning fraction (which has the largest coefficient of variation of the adult parameters in the biomass formula) for various values for the mean and coefficient of variation.

COASTAL EASTERN PACIFIC POPULATION BIOLOGY OF FISHES

Fishery biologist Gail Theilacker and NOAA Junior Fellow Amy Kimball completed a draft of a manuscript entitled, "Laboratory-cultured prey for larval fish; width-weight relation and caloric values for a rotifer and young stages of a harpacticoid copepod".

Width-weight and volume-weight models, plus caloric equivalents, are given for nauplii and copepodites, Tigriopus californicus, and rotifers, Brachionus plicatilis, ranging in width between 74 and 221 μ m. Between the smallest and largest size classes (a width increase of two times) rotifer dry weight increased from 0.10 to 0.47 μ g/animal and nauplii dry weight increased from 0.04 to 0.38 g/animal. Even though the organic tissue fraction of the rotifer had a lower caloric value than the organic fraction of the copepods, 4.8 cal/mg as compared to 5.9 cal/mg, an individual rotifer contained more calories than a nauplius of the same width. This is due to nauplii weighing less per unit width and containing more ash per unit weight than rotifers. The authors stress that these width-specific differences in caloric content

between two groups of animals of the same width and among life stages within a single animal group should be considered in bioenergetic studies.

Improved Procedure for Estimation of Anchovy Egg and Larvae Mortality Rate Applied

Mathematician Dr. Nancy Lo this month applied a more efficient estimation procedure for examining the mortality rate of anchovy eggs and larvae. Natural mortality in the early life history stages is an important biological parameter, and is especially important to the work on anchovy populations conducted at the Southwest Fisheries Center (SWFC). The egg production method and revised larva census estimate used by SWFC researchers to estimate anchovy spawning biomass requires the estimation of mortality rates of eggs and larvae.

The procedure currently in use to estimate these rates is that of nonlinear least squares estimation (NLSE). The NLSE is simple to use, but requires that the egg and larvae mortality rates be estimated separately. An estimation procedure which utilized both egg and larvae data together is likely to produce more precise estimates, and would, therefore, be desirable. With this in mind, Dr. Lo applied a maximum likelihood estimator (MLE), by which estimates of egg and larvae mortality rates are computed based upon 1980 and 1981 field data.

Each year since 1980, the ichthyoplankton data collected from CalCOFI cruises have been used to estimate the instantaneous mortality rate (IMR) of anchovy eggs and larvae. The egg and larva data are first grouped by age or length so that the i th group contains sample mean number of eggs or larvae ($\bar{y}_i$) at age t_i for a total of k age groups. The grouped data ($\bar{y}_i, t_i$) $i=1, \dots, k$ are then fitted to two mortality curves separately for eggs and larvae (less than 20 days), using nonlinear least squares estimation procedures (NLSE):

$$\bar{y}_i = \bar{y}_0 s(t_i) = \begin{cases} \bar{y}_0 e^{-\alpha t_i} & \text{for eggs} \\ \bar{y}_0 e^{-t_h^\alpha \left(\frac{t_i}{t_h}\right)^{-\beta}} & \text{for larvae} \end{cases}$$

where $s(t_i)$ is the survivorship function which is the probability that any individual passes the age t_i ,

$\bar{y}_0$ is the mean number of eggs at age 0 and is unobserved

α is the egg IMR

β is the larva IMR coefficient for the IMR of larva =

β/t is age dependent

and t_h is the hatching time in days.

An alternative estimation procedure is that of the maximum likelihood estimator, by which the egg and larva IMR can be estimated simultaneously through a truncated exponential and Pareto likelihood function.

$$L \propto \prod_{i=2}^k P_i^{N_i} = \prod_{i=2}^k \frac{[s(t_{i-1}) - s(t_i)]^{N_i}}{[s(t_i) - s(t_{i-1})]^N}$$

where $N_i = m(\bar{y}_{i-1} - \bar{y}_i)$ is the number of eggs (larvae) which died between ages (t_{i-1}, t_i) . m is number of net tows and $N = \sum_{i=2}^k N_i$

The partial derivatives of the logarithm of likelihood function

$(\frac{\partial \ln L}{\partial \alpha} = 0, \frac{\partial \ln L}{\partial \beta} = 0)$ are solved simultaneously for α and β to obtain their MLE. the asymptotic variance-covariance of MLE of α and β are also computed.

It was found that the precision of egg mortality MLE is improved over the NLSE whereas the reverse is true for the larvae, although the coefficient of variation of larva mortality MLE is less than 0.2 for 600 net tows or more (300 net tows for eggs and larvae each; see Table 1). The MLE procedures do not provide the estimator of eggs at age 0, a major parameter for anchovy spawning biomass estimation.

		$\hat{\alpha}$ (s.e.)	$\hat{\beta}$ (s.e.)	N^1	number of net tows (m)
1980	MLE	0.36	1.28		
		(0.013)	(0.10)	1440	961
		(0.028)	(0.22)	298	199
	NLSE	0.39	1.22		
		(0.103)	(0.031)		
	I^2	5	7		
1981	MLE	0.24	0.96		
		(0.01)	(0.07)	1792	1134
		(0.017)	(0.12)	637	403
	NLSE	0.13	1.53		
		(0.16)	(0.03)		
	I^2	5	7		

¹ $N = (\bar{y} - \bar{y}_k)m_i$: estimated total number of eggs and larvae dying between ages (t_1, t_k) .

² I = number of age groups used for nonlinear least squares estimation.

Table 1: the maximum likelihood estimates (MLE), and nonlinear least squares estimates (NLSE) of anchovy egg and larvae mortality (α and β) and their standard error (s.e.) based on 1980 and 1981 field data.

U.S. Mexican Research Ties Discussed

Dr. Reuben Lasker, Coastal Division Chief, reports that on February 17 and 18, members of the California Cooperative Oceanic Fisheries Investigation (CalCOFI) Committee, consisting of Dr. Izadore Barrett, Director of the Southwest Fisheries Center (SWFC), Mr. Herb Frey, California Department of Fish and Game (CDF&G), Mr. Joe Reid, Scripps Institution of Oceanography (SIO), Coordinator Lasker, Mr. George Hemingway (SIO), and Mr. John Grant (CDF&G), met with the director of the Instituto Nacional de Pesca (INP), Dr. Jorge Carranza, and other members of the INP, in Mexico City. The purpose of the meeting was to re-institute joint research between INP and CalCOFI, which had been discontinued in 1980. The meeting resulted in an agreement to reestablish subcommittees in particular areas of research (e.g., plankton and hydrography; stock assessment; modeling; data management systems; and other resources).

Mechanisms for exchange of information were established and joint cruises were discussed. A follow-up meeting will be held at the CalCOFI Conference in late October 1983.



1982 CalCOFI Investigation Committee (l-r): 1st row - Mr. John Carr, National Marine Fisheries Service (NMFS), Mr. Richard Schwartzlose, Scripps Institution of Oceanography (SIO), Dr. Reuben Lasker, CalCOFI Coordinator, Dr. Izadore Barrett (NMFS), Mr. Herb Frey, California Department of Fish and Game (CDF&G), Professor Joseph Reid, SIO. 2nd row - Mr. Richard Klingbeil, CDF&G, Alec MacCall (CDF&G, now of NMFS). The 1983 CalCOFI Committee includes Mr. Klingbeil as an alternate for Mr. Frey; Dr. John McGowan of SIO has replaced Mr. Schwartzlose; Mr. MacCall is no longer a member.

Oceanic Fisheries Resources Division

TUNA AND BILLFISH RESOURCES PROGRAM

Tuna Statistics Reported to ICCAT

Twice yearly, all member countries of the International Commission for the Conservation of Atlantic Tunas (ICCAT), to which the U.S. is signatory, are required to submit fisheries and biological statistics to the ICCAT secretariats. Mathematician Al Coan reports that preliminary 1982 statistics on U.S. Atlantic tuna fisheries and on catches of foreign-caught Atlantic tunas which are landed in Puerto Rico were submitted to the ICCAT Secretariat this month. The statistics, compiled by Coan, and biological technicians Tod Foster, Eugene Holzapfel, and Raul Rivera, include data on total catch and total effort, as well as length frequencies of tuna caught.

Seven U.S. purse seiners participated in the 1982 Atlantic fisheries, catching a total of 1,923 MT of tunas. Bluefin (661 MT) and yellowfin (686 MT) tunas dominated the catch, with the majority coming from the eastern Atlantic.

Table 1. Samples of foreign-caught Atlantic tunas obtained in Puerto Rico as of March 1, 1983. YFT = yellowfin tuna, SKT = skipjack tuna, BET = bluefin tuna, ALB = albacore, BLACKFIN = blackfin tuna, BB = baitboat, PS = purse seine, LL = longline, UNK = unknown.

SPECIES	GEAR	# of SAMPLES	# of FISH	SAMPLE TONNAGE
YFT	BB	19	1627	272.69
	PS	37	3003	2482.64
	UNK	12	473	263.01
	LL	1	89	67.00
SKT	BB	21	1966	1715.31
	PS	16	804	4807.19
	UNK	4	203	940.22
BET	BB	3	86	2.77
	PS	21	753	735.39
	UNK	4	107	155.13
ALB	LL	2	100	536.30
BLACKFIN	PS	1	50	6.12
BLACK SKIPJACK	PS	2	100	-

Nearly 8,500 Atlantic tunas, including yellowfin, bigeye, skipjack, black skipjack and blackfin tuna, and albacore from the catch of foreign-flag purse seiners and baitboats were sampled (Table 1). The average lengths, over various strata of gear and area, of yellowfin tuna ranged from 50 to 78 cm, for skipjack tuna from 42 to 59 cm, and for bigeye tuna from 51 to 96 cm. The average length of albacore (one area, one type of gear) was 81 cm, and of blackfin tuna, 56 cm.

In addition, release and recovery information on over 3,800 tuna and billfish tagged or recaptured in 1982 was submitted to ICCAT. The Miami, Florida Laboratory of the Southeast Fisheries Center was responsible for compiling this information, which will be used by ICCAT in the annual tagging lottery held in July.

MARINE MAMMAL BIOLOGY PROGRAM

SWFC Scientists Attend Marine Mammal Commission Meetings

Dr. Bill Perrin, Fishery Biologist, and Dr. Doug DeMaster, Wildlife Biologist, participated in 3 days of Marine Mammal Commission (MMC) meetings (24-26 February) in Honolulu, Hawaii. Perrin and DeMaster are members of the MMC's Committee of Scientific Advisors on Marine Mammals. The public meeting addressed present and future research on several marine mammal populations such as the California sea otter, bottlenose dolphin populations off the southeastern U.S. coast, the Hawaiian monk seal, and humpback whales in Hawaiian waters. Preparations for the upcoming North Pacific Fur Seal Commission and International Whaling Commission meetings were also reviewed, including discussions on the bowhead whale and live capture fisheries issues.

Most of the meeting was devoted to reviewing research on the Hawaiian monk seal and California sea otter. Two activities directed at promoting the recovery of the monk seal were discussed at length. One involves protecting weaned pups from predation by holding them in large outdoor pens for up to 2 months. Animals held in this way have been found to do well upon subsequent release. Another activity which has proved effective is to search out and release animals which have become entangled in scraps of discarded or lost gill and trawl nets.

Activities for the sea otter include continued population monitoring, evaluating habitat availability throughout California, and determining the impact of coastal gill net fisheries on local populations.

Information discussed by the public, invited speakers, and the Committee of Advisors will be summarized and presented as a recommendation to the Chairman of the Marine Mammal Commission. A transcript and executive summary will be made available to the public.

Monitoring of Pinniped Populations in the Channel Islands Begins

Dr. Douglas DeMaster, Leader of Coastal Marine Mammal Project, reports that a long-term study of pinniped populations in the Channel Islands Marine Sanctuary, California, has begun. The northern Islands (Santa Barbara, San Nicolas, San Miguel, Anacapa, Santa Rosa, and Santa Cruz) and their offshore waters are a haven for pinniped populations. Although extensive observations on the northern fur seal (Callorhinus ursinus) and elephant seal (Mirounga angustirostris) rookeries around San Miguel have been made, little is known of pinniped activities around Santa Cruz and Santa Rosa Islands. There are virtually no long-term data bases for pinniped population dynamics necessary for analyzing the effects of human disturbances such as boat traffic, specimen collecting, oil drilling and pumping, and fishing on pinniped movements, seasonal distributions and fluctuations of numbers.

The monitoring program, to be run jointly by DeMaster and Dr. Robert Delong, National Marine Mammal Laboratory, Seattle, Washington, is designed to determine how the seasonal distribution and abundance of pinnipeds and their pupping areas change with increase in their population levels and with increased use of these areas by human visitors. The program will enumerate California sea lions (Zalophus californianus) and northern elephant seal pups by area and season using ground counts, aerial surveys, and 9" positive transparencies. In addition, efforts will be made to correlate numbers of animals and vessel traffic. Counts of hauled-out animals will be supplemented by tagging of individuals and, in some cases, the deployment of a radio transmitter in order to follow day-to-day activities. The goal is to estimate the total number of animals utilizing a given area.

MARINE MAMMAL MONITORING AND ASSESSMENT PROGRAM

New Marine Mammal Assessment Procedure Evaluated

Dr. Tim Gerrodette, National Research Council NOAA Research Associate at the Southwest Fisheries Center, is evaluating the utility of a new technique for assessing marine mammal populations. Until now, the status of marine mammal populations has been judged by comparing the estimates of current population size to an estimated maximum population size, known as the carrying capacity. The new technique, termed dynamic response analysis, relies on a temporal series of population estimates or indices of population size to determine the status of a population relative to its maximum net productivity level (MNPL).

The theory underlying the new method has been worked out by Dr. Daniel Goodman of Scripps Institution of Oceanography. Gerrodette is investigating the best method of application of the theory to analysis of data which are being collected for pinniped stocks off California. Of particular interest are the required precision of population estimates and the number of sequential censuses necessary to make the technique a useful tool in management. Computer simulations of the dynamic response assessment procedure allow the estimation of the probability of making the correct determination of

the population level relative to the MNPL for any particular set of conditions.

The simulations assume that a marine mammal population is censused each year and that the dynamics of the population follow the logistic model. Some preliminary results are shown in the accompanying figures, where the logistic growth rate is set at 0.15. In Figure 1, the effect of longer sequences of population size estimates is shown. If only 5 population estimates (e.g., 5 years of censusing) are available, the technique will not be very useful (a probability of 0.5 means we might as well flip a coin to reach our decision). A sequence of 20 population estimates, however, allows the status of the population to be correctly determined with very high probability at all population levels except in the immediate vicinity of the MNPL (0.5 on the X-axis). These results argue for the importance of long-term monitoring programs for marine mammals.

In Figure 2, the effect of different levels of precision in population estimation, as measured by the coefficient of variation (CV), is shown. As would be expected, the lower the coefficient of variation (the more precise the census), the greater will be the probability of making the correct determination of the status of a population. In order for dynamic response analysis to be useful, we will require fairly precise estimates of population size (coefficients of variation of 0.1 or less). Effects of environmental variation and of changes in age structure will be explored in future simulations of the new assessment procedure.

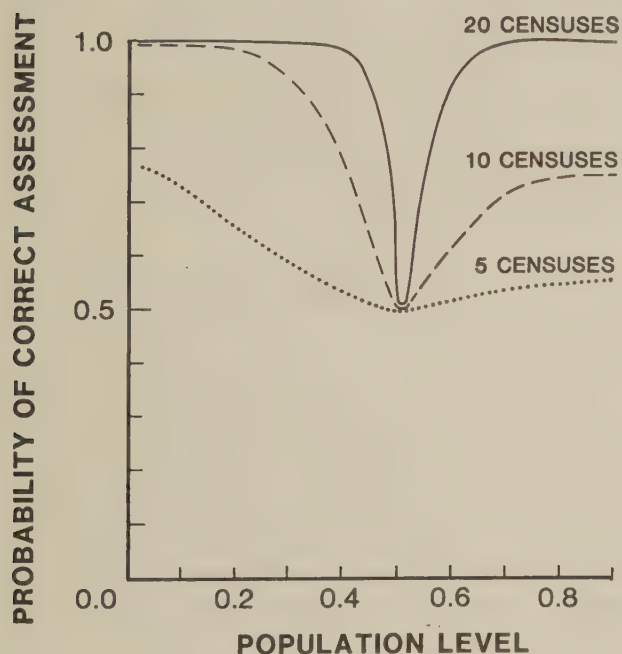


Figure 1 Effect of longer sequences of size estimates.

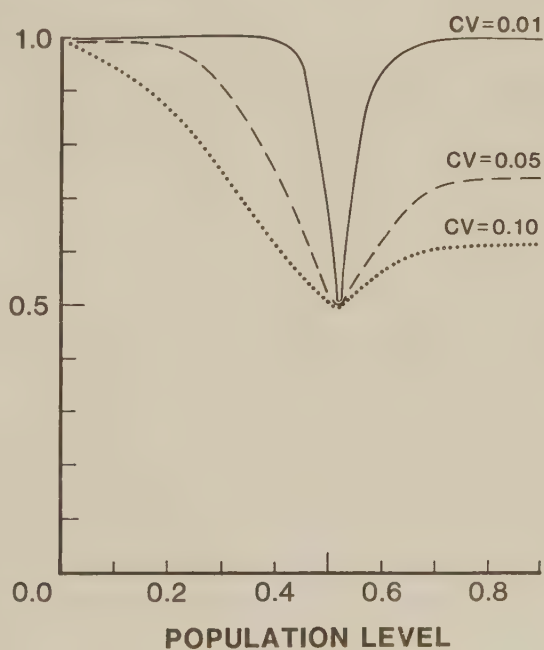


Figure 2. Effect of different levels of precision in population estimation.

Marine Mammal Census Continues in ETP

The NOAA research vessel, David Starr Jordan, departed Callao, Peru on February 7, to begin the second leg of the 1983 eastern tropical Pacific (ETP) marine mammal cruise, part of an ongoing effort to study the distribution and abundance of Pacific cetaceans in the ETP. This survey directed by fishery biologist Dr. Wes Parks of the La Jolla Laboratory, is covering the southern portion of the range of spotted and spinner dolphins in the eastern Pacific, to determine density of the populations south of the equator. En route to Tahiti, the Jordan is proceeding generally westward along 10°S latitude, zig-zagging from 5°S to 15°S.

Currently, there is an El Niño warm water event taking place in the eastern Pacific. In addition to conducting a systematic, computerized sighting survey of marine mammals, the scientific party is monitoring the El Niño by collecting oceanographic data. Scientists at the Southwest Fisheries Center and elsewhere are interested in the effects and extent of this year's El Niño on oceanographic conditions and their effect on the distribution and abundance of marine resources.

TIBURON LABORATORY

DEVELOPMENT TASK

Construction of FADs to Begin

Fishery biologist Bill Leet and Lt. Patrick Rutten, NOAA Corp, met with LT(jg) Richard Boy, U.S. Coast Guard, from the NOAA Buoy Office (NDBO) MTSL Station, Mississippi, to discuss the design, construction and deployment of fish attracting devices (FAD). Boy met with the Tiburon Laboratory personnel on his return from the Honolulu Laboratory where he also discussed FADs. The meeting proved to be helpful in the design of the Tiburon Laboratory's two FADs, which are to be deployed at the end of June from the NOAA Ship David Starr Jordan. Placement of the FADs will be in 100 fm of water, one 30 miles west and the other 60 miles southwest of San Diego.

Northern California Rock Crab Fishing Develops

Two shipments of rock crab (Cancer productus, C. antennarius, C. anthonyi), totaling 500 lb, were received this month from Eureka, California, for trial marketing in the San Francisco Bay area. Fishery biologist Sennen Salapare and NOAA Corp Lt Pat Rutten are coordinating the marketing trials of rock crab with Bay area seafood wholesalers.

Interest in rock crabs is increasing due to the continued decline of Dungeness crab (C. magister). Approximately one million pounds of rock crab are landed annually in southern California; however, rock crabs have yet to find large consumer acceptance in northern California.

Groundfish Economics

Edward Ueber, Industry Economist, attended a meeting with Southwest Region economists and industry representatives in Eureka, California. The meeting dealt with increasing the economic input into the management of groundfish by the Pacific Fishery Management Council (PFMC). Industry was especially interested in reestablishing the overall premise behind the PFMC's groundfish management which was that the groundfish fishery should be managed on a coastwide basis under a framework where species caught together would be managed together. Dr. Wesley Silverthorn of the Southwest Region will report on the research needs which will address the concerns of the industry.

Fish Identification Seminar Held for Enforcement Personnel

On March 19, the staff of the Rockfish Task and Fisheries Development Task presented a class on fish identification to National Marine Fisheries Service and California Department of Fish and Game enforcement agents.

Fishery biologist Tina Echeverria instructed agents on the identification of commercially important species of fish and invertebrates with emphasis on the use of fish keys for fish identification. Sus Kato presented a slide show and discussion on the various trawl and trap fisheries of the West Coast. Participants indicated that the knowledge acquired should make their work more effective.

FISH COMMUNITIES INVESTIGATION

Predatory Behavior of Brown Rockfish Defined

A study designed by fishery biologist Dr. William Lenarz on the dynamics of the brown rockfish population at the Tiburon Laboratory dock, and involving personnel of both Investigation Tasks (Rockfish Analysis and Predator/Prey), has included an analysis of predatory behavior. This work was done by Robert Van Syoce and served as the basis of his Master's thesis at California State University San Francisco

Results of his study indicate that brown rockfish are strongly visual predators, and appeared not to respond to olfactory and tactile stimuli. Attack rates were more affected by size of prey item than by shape and the fish preferred items close to the maximum size that would fit in their mouth. Handling time increased with prey size and decreased with fish size, and was higher for crabs than for cut pieces of anchovy of similar size, while proportion of successful attacks decreased with crabs of the same size. Starved fish were more persistent in handling prey than unstarved fish but starvation did not affect attack rates. In terms of volume consumed per time spent, preferred prey size is close to the optimum. Absolute values of the slopes of the "Benefit/Cost" curve tended to decrease with fish size, a result which is in agreement with the tendency of larger fish to consume a wider range of food sizes.

PHYSIOLOGICAL ECOLOGY INVESTIGATION

Fish Plasma Analysis Technique Described

Dr. R. Bruce MacFarlane, Oceanographer, is completing revision of a manuscript entitled "Determination of corticosteroids in fish plasma by high performance liquid chromatography". Outside referees reviewed the paper favorably but recommended inclusion of data from applications of the technique. Consequently, data from the recently completed experiment assessing the glucocorticoid response of striped bass to sublethal benzene exposure is being incorporated into the manuscript. Animals subjected to 21-day exposures of 0.1 and 1.0 ppm benzene displayed moderately elevated and statistically significant plasma cortisol concentrations as compared to levels in plasma of control animals. These data indicate that low levels of benzene

are stressful to striped bass and may explain physiological impairments and parasitically-induced host reactions observed in fish captured in the San Francisco Bay-Delta estuary which contained tissue burdens of benzene.

New data, comparing the efficiency of various extraction techniques for separating glucocorticoids from fish plasma, were also incorporated into the manuscript. Standard solvent extraction techniques, while adequate for mammalian plasma, are relatively inefficient and result in the coextraction of interfering compounds. The interfering compounds are probably lipoproteins, which are found in much greater concentrations in fish plasma than in mammalian plasma. Using ^{14}C radio-labeled glucocorticoids it was determined that the use of cartilages containing reversed-phase, hydrophobic packing recovered 90 to 100% of the plasma steroids (as compared to approximately 35% recovery using solvent extraction techniques) and reduced levels of interfering compounds.

The technique described in the paper can also be used to isolate and quantify other plasma steroids, such as mineralocorticoids, androgens and estrogens.

Identification of Serum Proteins in Striped Bass Initiated

Michael Bowers, Biological Technician, R Bruce MacFarlane, Oceanographer, and Brian Jarvis, Biological Technician, are conducting an investigation to identify and characterize the serum protein components of striped bass blood. Additional information on hematological variables, including hemoglobin, differential blood cell distribution, and hematocrit, will be recorded to determine the natural variability of these parameters. The study has a number of goals: to aid in clarifying this area of fisheries research, develop serum protein analysis as a diagnostic tool in fish, and explain data generated by the COSBS program.

The Cooperative Striped Bass Study (COSBS) has gathered voluminous data on serum protein profiles from laboratory and field studies. Multivariate factor analyses have shown that the amplitude of many of the serum protein bands generated by cellulose acetate electrophoresis relate to physiological, parasitic and pollutant factors. However, using changes in serum protein components in fish to diagnose nutritional and pathological conditions, a practice routinely employed in medical laboratories, has been seriously impeded by the lack of protein identification.

Other reports on the serum protein composition of fishes commonly identify individual components solely by comparisons to the electrophoretic mobilities of human serum proteins. This is clearly inadequate, particularly in view of the radically different protein profiles of fish and human sera. A preliminary, qualitative experiment conducted by Michael Bowers illustrates this point. Using a technique that precipitates globulins from serum, followed by electrophoresis of the supernatant, Bowers found that, as expected, globulins were removed and protein band 1, which is albumin in human serum, remained intact. However, when the same procedure was conducted on striped bass serum, many protein bands were eliminated (globulins) or

significantly reduced (including band 1) and protein band 5 remained intact. It is generally believed that albumin is the dominant serum protein; in humans this is band 1 but in striped bass this is often band 5. Also, in humans and other mammals albumin levels in serum are known to respond to physiological stress. In striped bass containing high pollutant body burdens or exposed to pollutants in the laboratory, protein band 5 is often significantly elevated. While this preliminary evaluation by no means confirms which serum protein band is albumin, it does indicate that further investigation is required.

The present investigation will entail a number of techniques to identify individual serum protein components, including precipitation reactions, direct spectrophotometric determinations of albumin, molecular weight analyses, and immunoelectrophoresis. Inter- and intravariability of serum protein components in striped bass specimens will also be assessed.

FISHERIES INFORMATION SYSTEMS AND AUTOMATIC DATA PROCESSING

CALFIN Update

Representatives of the Southwest Fisheries Center (SWFC), Southwest Region (SWR), and California Department of Fish and Game (CDF&G), met several times in February to discuss Automatic Data Processing (ADP), port sampling, and statistics activities in California. The interpretive structural modeling method was used at this meeting to develop a preliminary planning chart. A subcommittee composed of Fred Kellenberger, SWFC, Svein Fougner, SWR, and Dick Heimann, CDF&G, was established to complete the CALFIN planning chart.

The subcommittee focused initially on the "product" end of the chart. While it was agreed that stock assessments belong at the far right, or product end, it was felt that the goal of CALFIN, "To provide and make available on a timely basis data necessary for marine fisheries management, research and planning," should be the final activity. In other words, the ultimate point of all the data collection and management activities is to provide the basis for better and more timely decisions by participants in CALFIN. A meeting will be held on March 8, 1983, by the full committee at the SWFC to discuss the CALFIN planning chart and to decide the next step in the planning process.

Susan Iacometti, Computer Systems Programmer, completed the final back-up for the 1974, 1975, and 1976 coastwide data for the Fisheries Resources Information System (DRIS). She is now reviewing the specifications she received during the January 28 PACFIN meeting in San Francisco for implementing the Washington, Oregon, and California catch data for FRIS.

WPACFIN Update

Work Continues on Western Pacific Fishery Information Network (WPACFIN)

The Memorandum of Understanding (MOU) for implementing WPACFIN in American Samoa has been signed by all parties and is now in effect. The MOU's have now been completed with all participating agencies in the western Pacific, except for one minor hitch--the MOU mailed by the Commonwealth of the Northern Mariana Islands has been lost on two separate mailings.

ADP Operations

Dorothy Roll, Computer Systems Analyst, reports that the University of California San Diego's (UCSD) computer services contract ends on June 30, 1983. A request to continue services from July 1, 1983, through September 30, 1984, is being prepared. The procurement package with justification to contract only with UCSD will be submitted in early March to Washington, DC,

for approval processing. Included in this request package will be the extension of the University of Hawaii (UoH) computer services from July 1983 through September 1984 for the Honolulu Laboratory.

During February, two procurement packages were sent to Ray Tillery, NMFS Data Management Office in Washington, DC, for monitoring through the approval channels. One request was for the procurement of a data set and lease line for communication between the Honolulu Laboratory and the IBM system at the University of Hawaii (UoH). The communication devices are required for interfacing the Honolulu Laboratory's Molecular Super Micro 64X with the UoH computer. The other request was for the procurement of the Molecular 64X for the La Jolla Laboratory. The super micro multi-user CP/M based system will be used for administrative and data management projects. The peripheral ordered with the unit to back-up disk files is the Cipher Data Unit, 9-track 1600 bpi tape drive, with software and hardware interface. The Financial Reporting System (FRS) is the first management system targeted for implementation on the Molecular. Ten application processors were ordered to activate ten of the 32 ports. Two of the ten ports will be for dial-up communication access by the Honolulu, Tiburon, and Monterey Laboratories, and the Regional Office in Terminal Island. The remaining ports will be distributed to the key users for data entries and queries.

Approvals for requests submitted during December and January have been received. They are 1) the ownership transfer of terminals and printers from the East-West Center to the Honolulu Laboratory, 2) the purchase of the Molecular 64X Model 136-32 for the Honolulu Laboratory, and 3) the purchase of four printers for hardcopy output from CRT terminals and the La Jolla Standard Microsystems. Two of the four printers are the TAB 80 column dot matrix printer for the CRT terminals in the Coastal Fisheries Resources Division (CFRD). The other two are Epson 132 column dot matrix printers, one for the Standard Microsystems in CFRD and the other for the Standard Microsystem in the Regional Office in Terminal Island.

Implementation of Standard Word Processing System Discussed

The Word Processing Committee met on February 17 to discuss the process for implementing a word processing system for the La Jolla Laboratory. The members (John Hunter, Julie Shoemaker, and Jack Brown from Coastal Fisheries Resources Division, Andy Dizon and Frances Begley from the Oceanic Fisheries Resources Division, Fred Kellenberger, Dorothy Roll, and Lorraine Prescott from Data Management and Technical Support) agreed to the evaluation of WORDSTAR by the secretaries on the committee. WORDSTAR, a popular CP/M word processing software was selected because many La Jolla scientists with access to the microsystems are using WORDSTAR for their manuscripts, reports, and letters/memorandums. During the evaluation period, Ms. Prescott, Ms. Shoemaker, and Ms. Begley will use the La Jolla Standard Microcomputer and the TAB 132/15 CRT terminals, which feature the IBM selectric keyboard and the 80 column and 132 column viewing without horizontal scrolling on a 15" diagonal screen. The evaluation will begin when the INSTALL patch on WORDSTAR for the TAB terminal is installed.

* * * * *

Robert Nydam, Computer Programmer Analyst, attended the Integrated Computer Systems course, "Real-Time System Design for 8 and 16 Bit Processors" in Los Angeles from February 1 through 4. Topics covered included a survey of currently available 16 bit microprocessors, application specifications, 16 bit versus 8 bit technology, and application development tools. The ADP Operations Group is currently investigating 16 bit microcomputers which will aid the Center's research staff.

* * * * *

A computer technical users meeting was held February 10. Rich Charter, Data Manager of the Coastal Fisheries Resources Division, gave a formal training session on using EDT, the editor on UCSD's VAX System. The Center's new video equipment, researched and selected by Ms. Iacometti, was successfully utilized for this session. The equipment consists of a TAB 132/15 CRT terminal, a VEN-TEL modem, a video projector, and a 5-foot daytime screen. The printer, a peripheral for the video system, was not needed for this meeting.

* * * * *

In researching microcomputers, printers, and terminals that would satisfy future needs of the Center, computer specialist Rich Charter, computer systems programmer Susan Iacometti, programmer Robert Bistodeau, and systems analyst Dorothy Roll attended a hardware exposition at the San Diego Community Concourse on February 18, 1983.

MISCELLANEOUS

PUBLIC AFFAIRS

Tiburon Laboratory

Susan Smith, Fishery Biologist from the Tiburon Laboratory, joined with Laboratory Director Norman Abramson and Regional Office representatives Jay Ginter, Joe Farrell and Bob Pata in staffing the National Marine Fisheries Service (NMFS) booth at the 1983 San Francisco International Sportsmen's Exposition held at Moscone Center. The Expo, which ran from February 16 to 20, housed approximately 350 exhibitors and had an estimated attendance of 40,000 people.

The NMFS booth consisted of the standard 8 - by 10-ft NMFS "pop up" traveling display, and a 7- by 8-ft display provided by the Tiburon Laboratory showing San Francisco Bay fishing grounds, angling facilities and fishes. There was also a narrated, rear-projection slide show describing the programs of NMFS, the Southwest Region and the Southwest Center. Certain hand-outs, such as fish recipes and xerox copies of two local fishing maps from the Center publication "Angler's Guide to The U.S. Pacific Coast" were very popular, as were two exhibit copies of the Anglers Guide itself (order forms were provided).

Honolulu Laboratory

- February 2 - Dr. Jeffrey Polovina spoke on "Approaches to resource assessment" at the Waikiki Aquarium (1983 Spring Lecture Series).
- 11 - Dr. Richard Brill presented a seminar on tuna physiology at Dr. Lamarr Trott's University of Hawaii graduate seminar class (Zoology 691B).
- 16 - John Henderson spoke on "The problems of interactions between marine mammals and fisheries" at the Waikiki Aquarium.
- 18 - Richard S. Shomura presented a seminar on fish aggregating devices at Dr. Trott's University of Hawaii graduate seminar class (Zoology 691B).
- Reginald Gooding served as a judge for the Hawaii Science and Engineering Fair at St. Ann School and St. Louis High School.

La Jolla Laboratory

- February 9 - Dr. Reuben Lasker, Chief of the Coastal Fisheries Resources Division, presented a lecture on "Fluctuations in Fish Populations" at the University of California, Santa Cruz.
- 16-17 - Dr. Lasker presented the "Fluctuations in Fish Populations" lecture at Centro de Investigacion Cientifica y de Educacion Superior de Ensenada, Ensenada, Mexico.

PRESS RELEASES

La Jolla Laboratory

- February 2 - "U.S. - Soviet Research Cruise Scheduled"
- 23 - "NOAA Scientists to Study Dolphin Behavior in the Eastern Tropical Pacific"

SEMINARS

Honolulu Laboratory

- February 4 - Linda M.B. Paul, Department of Zoology, UH, spoke on "Trap selectivity in captive populations of spiny lobster, Panulirus marginatus."
- 25 - M. Walker, Department of Zoology, UH, spoke on "Magnetic compass sense and a possible sensory mechanism in yellowfin tuna, Thunnus albacares."

La Jolla Laboratory

- February 3 - Dr. Arvind Khilnani and Dr. Edison Tse, Department of Engineering - Economic Systems, Stanford University, presented a lecture on "Development and Implementation of an Integrated Shrimp Fishery Management System for the Gulf of Mexico."
- 15 - Dr. James Power, Post-Doctoral Research Associate, National Research Council, gave a talk on "Simulation of the North Atlantic Drift of Anguilla leptcephali."

TRAINING

La Jolla Laboratory

- February 14 - Virginia Hostler, Administrative Officer, "Performance Appraisal," Office of Personnel Management, Los Angeles, California.
- February 15 - Dr. Tim Smith, Fishery Biologist, "Scientific
August 1 Writing".
- February 23 - Eric Lynn, Biological Technician, "Powerboat Operation and Seamanship," Coast Guard Auxiliary.

MEETINGS AND TRAVEL

Honolulu Laboratory

- January 31 - Richard Shomura traveled to Japan to meet with
February 7 officials of the Japan Fisheries Agency and to attend the Japan Tuna Conference in Shimizu where he presented a talk, "A note on tuna research activity in the U.S.A."
- February 2-3 - Richard Uchida attended the Board of Directors meeting of the Pacific Tuna Development Foundation at the Hawaiian Regent Hotel.
- 11 - Richard Shomura, Dr. Jeff Polovina, Reginald Gooding, and Richard Uchida participated in the meeting of the Coordinating Council for Research--Northwestern Hawaiian Islands.
- 24-26 - Richard Shomura, William Gilmartin, John Henderson, G. Balazs, E. Bowlby T. Johanos, A. Kam. G. Peiterson, and R. Watson attended the meeting of the Marine Mammal Commission at the Kaimana Beach Hotel.
- 26 - Richard Uchida attended a reception in honor of visiting scientists in aquaculture from Burma at Aquatic Farms, Kaneohoe, Hawaii.
- 27 - Richard Shomura departed Honolulu for meetings at the Tiburon Laboratory and the Center-Region Management meeting at Dana Pt., California.

La Jolla Laboratory

- February 1-4 - Robert Nydam traveled to Los Angeles, CA to attend a microcomputer training course.
- 2-4 - John Hunter traveled to Miami, FL to attend an annual NMFS Publications Committee meeting.
- 4-13 - Wes Parks traveled to Callao Peru to join scientific cruise of the David Starr Jordan in progress as Chief Scientist.
- 10-12 - Dan Huppert traveled to College Park, MD to attend an NMFS economics meeting.
- 11-14 - Paul Smith traveled to Pt. Hueneme, CA to meet the Townsend Cromwell to pick up samples of plankton and fish and analyze tow data.
- 13-15 - Virginia Hostler traveled to Los Angeles to attend an OPM training course.
- 15-21 - Doug DeMaster traveled to San Miguel Island to tag elephant seals.
- 15-28 - Chuck Oliver traveled to San Miguel Island to conduct tagging of elephant seals.
- 16-18 - Izadore Barrett and Reuben Lasker traveled to Mexico City, Mexico to meet with the Director of the Instituto Nacional de Pesca.
- 21-23 - Reuben Lasker traveled to Ensenada, Mexico to discuss mutual research with scientists at CICESE.
- 22 - Izadore Barrett traveled to Sacramento, CA to attend the Annual Legislator's/Fisherfolk's Meeting.
- 22-25 - Orientation meetings for the Surveyor cruise were held throughout the week in both the auditorium and small conference room.
- 23-27 - William Perrin traveled to Honolulu, HI to attend a meeting of the Marine Mammal Commission.
- 24-28 - Mark Lowry and Sandy Hawes traveled to San Clemente Island to conduct pinniped census, tag resights, scat collection and marine mammal salvage.
- February 27 - Mike Laurs traveled to Eureka, CA, Crescent City, CA,
March 3 Fort Bragg, CA, San Francisco, CA, and Morro Bay, CA to participate in albacore workshops for fishermen.

Tiburon Laboratory

- February 15 - Ed Ueber traveled to Eureka, CA to attend a ground-fish economics meeting.
- 16-20 - Susan Smith helped staff the MMFS exhibit at the 1983 San Francisco International Sportsmen's Exposition, at Moscone Center in San Francisco.
- 18-26 - Sus Kato traveled to Catalina Island, CA to attend the shark conference, then went on to San Pedro, Los Angeles, Oxnard, Santa Barbara, Avila Beach, Morro Bay, Salinas and Monterey, CA to confer with fishermen and processors regarding the study projects.
- 20-26 - Bill Leet traveled to Los Angeles, San Pedro, Oxnard, Santa Barbara, Avila Beach, Morro Bay, Salinas and Monterey, CA to confer with fishing industry representatives to discuss development of fisheries.
- 22 - Norman Abramson and Edward Ueber traveled to Sacramento to attend the "Fishermen's Forum". This is an annual event which allows fishermen and other interested parties to express their views on fishery problems to the California Legislature's Joint Committee on Aquaculture and Fisheries.
- 25 - Lt. Pat Rutten, NOAA Corp, joined the David Starr Jordan in the South Pacific for a 2-month augmentation trip.

VISITORS

Honolulu Laboratory

- February 8 - Richard Croft, Fisheries Officer, Ponape, Federated States of Micronesia, visited Richard Shomura.
- 15 - Barney Smith, Fisheries Advisor, South Pacific Commission, Noumea, New Caledonia, Dr. Jerry A. McCall, Director, and Richard Boy of the NOAA Data Buoy Office, met with Richard Shomura to discuss fish aggregating device problems in the South Pacific.
- 18 - Dr. Z. Suzuki, Far Seas Fisheries Research Laboratory, Shimizu, Japan, visited Richard Shomura. Dr. Suzuki was participating on a cruise of the Shoyo Maru which made a stopover in Honolulu.

- 19-23 - Richard Shomura and Dr. Polovina traveled to Saipan and Guam to participate in the meetings of the Council.
- 23 - Capt. S. Yamamoto of the Hokusei Maru and Co-Chief Scientist Dr. T. Yamamoto of the University of Hokkaido, met with Richard Shomura to discuss squid research. The Hokusei Maru was in Honolulu before returning to Japan after completing the third SWFC Honolulu Laboratory-University of Hokkaido cooperative squid research cruise in Hawaiian waters.
- 23 - Richard Shomura and Fletcher Riggs met with Dr Wesley Park of the EWC to discuss the possible extension of the Honolulu Laboratory's hookup with the EWC's computer.
- 25 - Barbara K. Rothschild of NMFS International Fisheries, Washington, DC, visited Richard Shomura.
- 28 - Ian Hume and Laurie Hayworth of Mass Microencapsulation Research Group, London, England, visited Dr. Brill and Randolph K. C. Chang.
- 28 - The scientists from Burma visited Richard Uchida.

La Jolla Laboratory

- February 7 - Julio Solis, CICESE, Ensenada, B.C , Mexico.
- 8 - Gadabout Club of San Diego. A group of 40 senior citizens visited the Center for a film slide showing of research activities and a tour of the facilities.
- 14 - Carlos Montero and Tony Parinello of the San Diego Chapter of the Oceanus Society met with Izadore Barrett.
- 17 - Stephen Goldberg, Biology Department, Whittier College.
- 22 - Ed Pidgeon, The Results Company, was at the Center to meet with the La Jolla-based Center Management Team.
- 23 - Thomas L. Miller, Pacific Analysis Corporation, Honolulu, Hawaii.
- Dr. Joseph Wong, NOAA, Research and Development, Washington, D.C , met with Deputy Director John Carr.

- 24 - John Kelemec, New South Wales Fisheries, Salamander Bay Australia.

Tiburon Laboratory

- 8 - Yutaka Yamada, Nippon Suisan Kaisha Ltd , Tokyo, Japan.
- 9 - Kate Monahan, Providence Seafoods, Tomales, CA.
- Richard Edester, San Anselmo, CA.
- Sam Wilson, San Anselmo, CA.
- 17 - Lt (jg) Richard Boy, USCG, NOAA Data Buoy Center, MSTL, Station, MS.

PERSONNEL ACTIONS

Honolulu Laboratory

- February 5 - Donell M. Wong, Computer Clerk - Resignation.
- 14 - Rachel S. H. Louie, Computer Programmer - Part-time Temporary Appointment.
- 20 - Brent M. Miyamoto, Computer Assistant - Part-time Temporary Appointment.
- James H. Prescott, Biological Technician (Fisheries) - Conversion to Temporary Appointment.
- 21 - C. Edward Bowlby, Wildlife Biologist - Extension of Temporary Appointment.

La Jolla Laboratory

- February 2 - Susan Chivers, Computer Assistant - Pay Adjustment to Full-time.
- 6 - Richard Methot, Fishery Biologist - Promotion.
- 16 - Cynthia Thomson, Industry Economist - Extension of Appointment.
- 20 - Robert Nydam, Computer Programmer Analyst - Promotion.

- Lee Innes-Brown, Physical Science Technician - Pay Adjustment to Full-Time.
- Jacqueline Jennings, Fishery Biologist - Name change.
- 21 - Virginia Cass, Fishery Biologist - Extension of Appointment.

UNITED STATES
DEPARTMENT OF COMMERCE

AN EQUAL OPPORTUNITY EMPLOYER

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE
SOUTHWEST FISHERIES CENTER
8604 LA JOLLA SHORES DRIVE
P.O. BOX 271
LA JOLLA, CALIFORNIA 92038

OFFICIAL BUSINESS

PENALTY FOR PRIVATE USE, \$300

POSTAGE AND FEES PAID
DEPARTMENT OF COMMERCE
210



THIRD CLASS

N.M.F.S.
P.O. BOX 3830
HONOLULU, HAWAII 96812

L01